

## A combined anesthesia technique for intubation in a pediatric patient with difficult airway

Pediatric patient with difficult airway

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### Abstract

Difficult airway management techniques in adults often cannot be applied to children. Therefore, specific pediatric algorithms have been developed. The case of using a combination of techniques on a pediatric patient suffering from an extremely restricted mouth opening is reported here. A fiberoptic bronchoscope assisted nasotracheal intubation was performed with topical anesthesia and an ultrasound-guided bilateral superior laryngeal nerve block under continuous sedation.

### Keywords

Airway; Intubation; Pediatrics; Ultrasound; Nerve block; Fiberoptic bronchoscope

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## Introduction

Knowing and applying the necessary techniques for difficult airway management in children is very important for anesthesiologists. The case of a fiberoptic bronchoscope (FOB) assisted nasotracheal intubation performed with topical anesthesia and ultrasound guided bilateral superior laryngeal nerve block (SLNB) under continuous sedation in a pediatric patient is reported here.

## Case Report

A 9-year-old male patient (weight 30 kg) was undergoing temporomandibular joint (TMJ) replacement operation. He was unable to open his mouth during the airway examination because of a TMJ ankylosis (Figure 1). His general condition and medical history were normal.

The anesthetic plan was to perform an FOB intubation under sedation and spontaneous breathing. After obtaining written informed consent from the parent, standard monitoring was performed in the operating room. All resuscitation equipment was ready in case of an intubation failure. The back-up plan was an emergency tracheostomy. To reduce secretions, 0.01 mg/kg IV atropine was administered. The patient was then IV administered 0.03 mg/kg midazolam, 1 mg/kg ketamine and 0.5 µg/kg remifentanyl intravenously and started on a 0.1 µg/kg/min remifentanyl infusion. The patient was responsive to verbal commands or tactile stimulation and the eyelash reflex was not lost. A 4 % lidocaine spray was also topically administered to the patient's nasal mucosa.

It was also decided to perform a SLNB to the larynx. A portable ultrasound machine (USG, 5–10 MHz linear probe, Nerve block, GE Medical Logiq) was used. The patient's neck was scanned with ultrasound, and the hyoid bone was easily identified. The superior laryngeal nerve (SLN) was observed below the level of the great hyoid horn. A 22-gauge needle was used to inject 0.5 ml of 2% lidocaine under ultrasound guidance in an in-plane configuration. This process was applied to the other side as well.

Topical anesthesia was applied to the nasal mucosa with a 4% lidocaine spray. A lubricated modified nasal trumpet was placed into the right nostril and then connected to the anesthesia circuit system, and 3 L/min oxygen was administered as the child ventilated spontaneously. A fibroscope (11101RP1, Karl Storz Endoskope, Germany) was directed to the left nostril after placement in a size 5.0 mm tube. It was then advanced to the nasopharynx, and 1 ml of 2% lidocaine was sprayed after vocal cord visualization. An endotracheal tube passed easily through the vocal cords without triggering a cough reflex, compromising the airway or raising the blood pressure or heart rate. The correct placement of the endotracheal tube was confirmed with the fibroscope, capnography, and auscultation. Overall, the operation was uneventful. At the end of the successful surgical procedure, the patient was uneventfully extubated.

## Discussion

Numerous combined anesthesia techniques have been described in previous reports [1-5]. Fiber optic intubation (FOI) is the gold standard of management for a predicted difficult airway. Anesthesia of the larynx with local anesthetics is



**Figure 1.** The patient was unable to open his mouth during the airway examination because of a temporo-mandibular joint ankylosis.

needed during this procedure. In a recent study, it was found that one could successfully intubate the trachea using awake FOI with a topical application of either 2 or 4% lignocaine in the spray-as-you-go technique. However, 61 to 74% of the patients had a grimace or cough response during intubation, which they attributed to inadequate anesthesia in the airways [3]. SLNB is an airway anesthesia technique that can paralyze the lingual radix, epiglottis, and cricothyroid muscles and is thus expected to suppress the gag and cough reflexes. However, it is sometimes difficult to recognize landmarks when the patient is obese or has an anatomical abnormality due to pathology [5].

Recently, guided ultrasounds have been shown to be useful and an alternative for identifying and assisting with SLNB in patients undergoing awake FOB intubation [5]. US-guided SLNB may not be a commonly considered approach for pediatric cases but in the current case, the use of ultrasound made it possible to perform an SLNB with low dose local anesthetic without complications.

Since additional lidocaine was administered for the SLN block and to the trachea, it would be important to know the total dose of local anesthetic administered for the entire intubation sequence. A maximum dose of 4 mg/kg of lidocaine can be used per 90-200 minutes and we did not use a higher dosage. Sedation is frequently used to make the process more tolerable to patients. Benzodiazepines, propofol, opioids, alpha2-adrenoceptor agonists, and ketamine are the main classes of drugs that have been described to facilitate FOI. The ideal choice of drug may vary depending on the patient and the indication for FOI [2]. In the current case, we preferred combination because of their synergistic sedative effects. The combination of midazolam, remifentanyl, and ketamine allowed the patient to tolerate the procedure while still spontaneously

breathing. Oxygenation was maintained via nasal trumpet in this patient. Alternative techniques for improved oxygenation include endoscopy mask, which does not run the risk of nasal bleeding like the insertion of a nasal trumpet.

### **Conclusion and Learning Points**

1. In this case, FOB-assisted nasotracheal intubation in a pediatric patient was facilitated by combining an ultrasound-guided bilateral SLNB with topical anesthesia under sedation.
2. An interesting aspect of the approach to this patient was the successful use of US-guided for SLNB.
3. Although this approach is rarely used it can be used in pediatric patients. This combination seemed effective and did not cause any discomfort or notable complications.

### **Scientific Responsibility Statement**

*The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

### **Animal and human rights statement**

*All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.*

### **Conflict of interest**

*None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.*

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